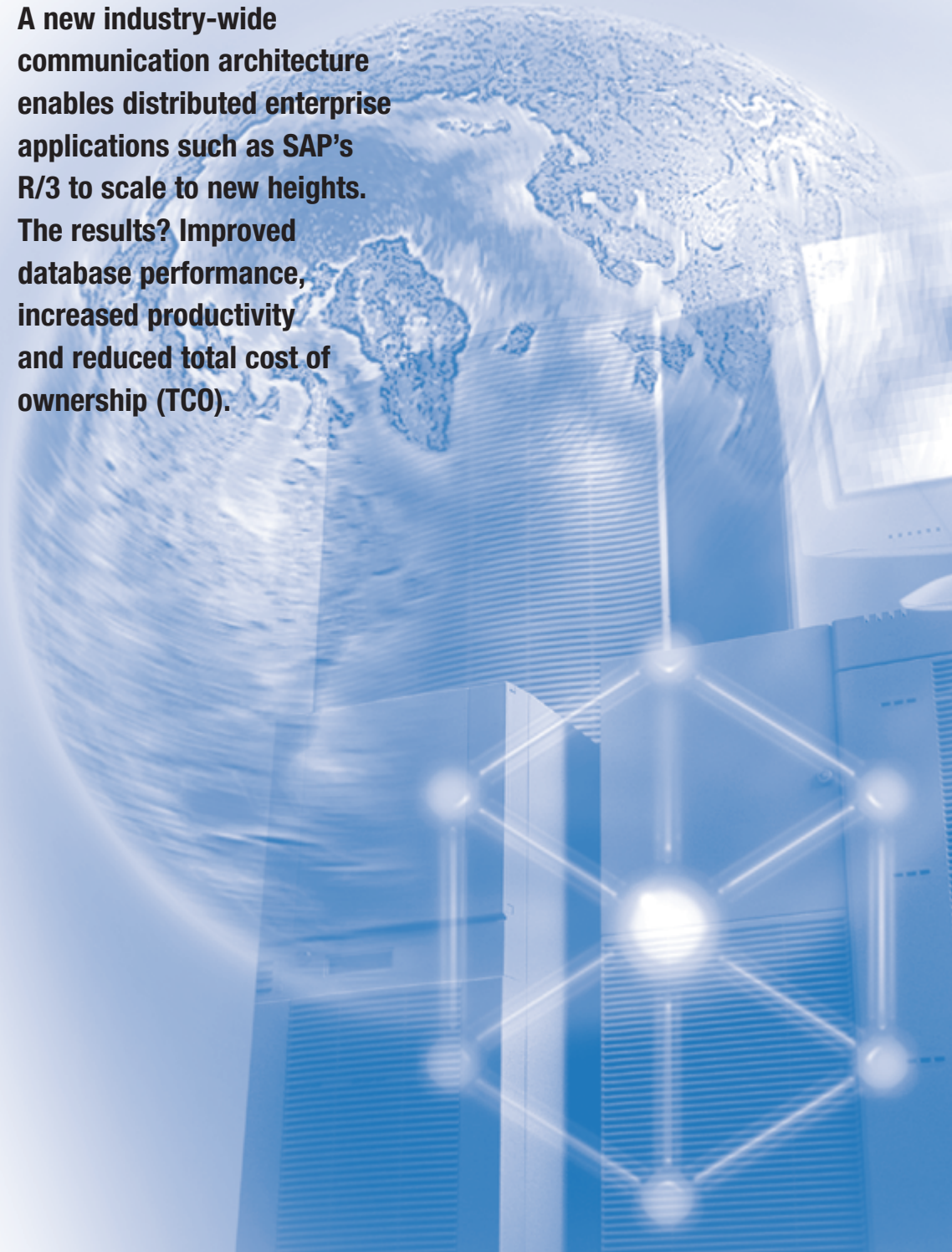
SAP's R/3 and the Virtual Interface (VI) Architecture

A New Era for Enterprise Applications

A new industry-wide communication architecture enables distributed enterprise applications such as SAP's R/3 to scale to new heights. The results? Improved database performance, increased productivity and reduced total cost of ownership (TCO).



intel®

Enhanced Scalability for Enterprise Applications

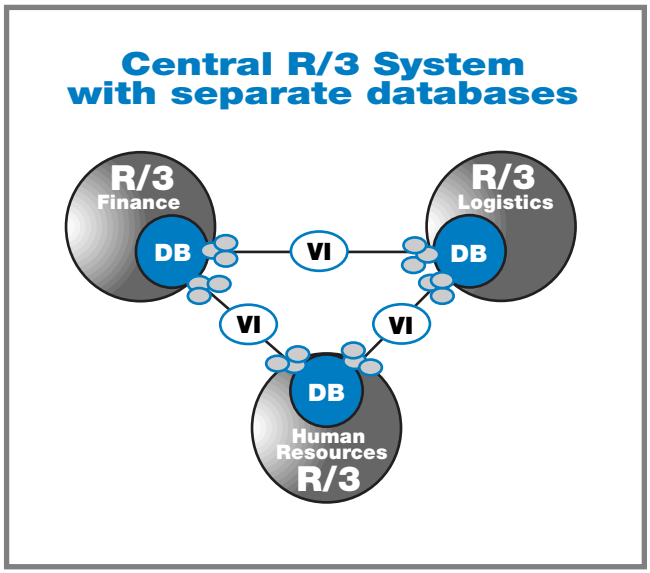
The economies of the volume marketplace have made standard high-volume (SHV) servers based on Intel's Pentium® Pro and Pentium II processors a cost-effective, high-performance, high-availability platform for enterprise applications such as R/3. In two-and four-processor server configurations, SHV server clusters extend scalability and add high availability to that list of benefits.

Now, thanks to a new, industry-wide cluster communication architecture, SHV servers are scaling up even further — and reducing total costs of ownership as well.

The ***Virtual Interface (VI) Architecture*** helps transform a collection of independent SHV servers into a highly scalable cluster that can meet the performance and capacity requirements of the largest and most demanding enterprise applications. And because VI Architecture is an open solution, it opens the door to a new era of cost-effective, highly scalable platforms for distributed enterprise applications.

SAP, long a pioneer in exploiting innovative technologies to solve customer needs, has undertaken a shared development project with Intel to integrate VI Architecture with R/3. The project underscores:

- the benefits VI Architecture delivers to leading enterprise applications.
- the industry momentum gathering behind this new approach to large-scale clustering of volume platforms.

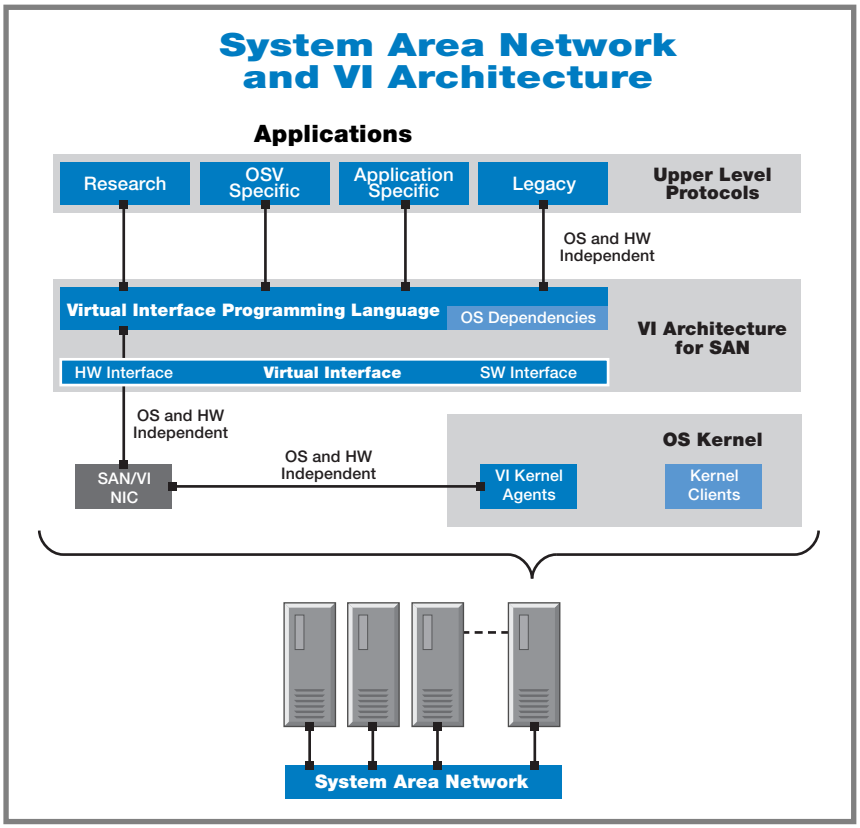


With VI Architecture, messages are exchanged faster between distributed SAP application modules.

Integrating VI Architecture with R/3

How will Virtual Interface Architecture enhance SAP's R/3?

VI Architecture specifies an emerging high-speed communication interface for clusters of servers and workstations. Its fast server-to-server communications can enhance an application's scalability and performance in a variety of ways — from allowing a single application to run efficiently across dozens of clustered nodes, to speeding up the exchange of data between distributed application modules running on different application servers.



VI Architecture enables high speed communications between applications and System Area Networks (specialized networks optimized for low-latency, high-bandwidth cluster communications).

Why VI?

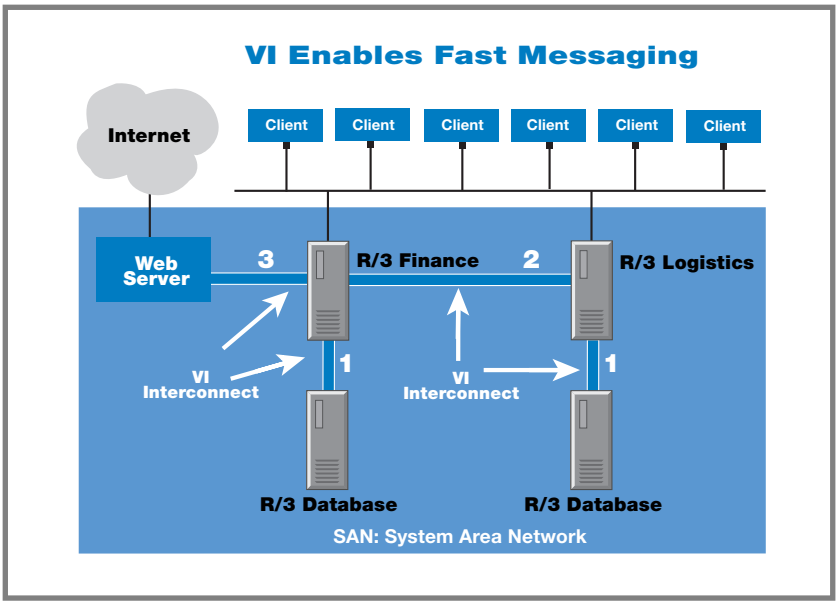
What are the key benefits of the VI Architecture?

- **A scalable/available approach.** Clustered computers based on the Intel computer architecture and VI Architecture let businesses build economical scalable clusters that meet the growing need for 24-hour-a-day, seven-day-a-week availability.
- **Lower TCO through modular designs.** In contrast to proprietary cluster technologies, whose low-volume nature makes them inherently expensive and closed, hardware clusters based on the Intel architecture and VI Architecture are open, flexible and easy to expand. This ease of integration helps lower TCO.
- **Ready-to-run implementations.** Distributed applications don't have to master the details of different networking architectures or rewrite their code when the next generation architecture comes along. VI Architecture shields application developers from these details.
- **A standard, multi-vendor cluster API for distributed applications.** As an open, standards-based solution, VI Architecture offers high-speed inter-process and intra-process communications for distributed applications.

For distributed multi-tier applications such as R/3, VI Architecture improves communication speeds in three critical areas:

1 Between the database and its application servers. With VI Architecture in place, messages travel more quickly between the servers and the database, and the CPU is relieved of much of the software overhead ordinarily associated with messaging. As a result, the database, the application servers and the CPUs operate more efficiently: the database spends less time waiting for work, the application servers spend less time waiting for responses, and the CPUs have more cycles free for other work. The customer sees improved applications performance, and gets better mileage out of the same equipment.

2 Between distributed application components. As applications become more highly distributed and the use of distributed objects becomes more prevalent, the demands for interprocess communication increase in two ways: more messages flow between application components such as SAP Business Objects, and there's more data in the messages. By providing high-speed, low-latency communications that enhance R/3's roadmap for distributed object-oriented application modules, VI Architecture supports the business flexibility and nimbleness afforded by object-oriented approaches. Because it speeds interprocess communication, VI Architecture enables businesses to increase application capability while maintaining response times.



VI Architecture improves the scalability of distributed applications by allowing faster communications between the database and its application servers (1), between distributed application components (2), and between applications and external components (3).

3 **Between applications and external components.** The explosion of Intranet and Internet services heightens the need to integrate distributed applications with external services. With VI Architecture, businesses and vendors can integrate the R/3 system with a third-party service, such as an Internet commerce server, or a data warehouse, such as SAP's Business Information Warehouse (BIW). For convenient, cost-effective integration, VI Architecture can also be used to speed shrink-wrapped messaging middleware, such as DCOM, to provide fast communications between all integrated elements. This gives R/3 users greater flexibility to develop comprehensive, high-performance, cost-effective solutions.

In all three cases, VI Architecture reduces communications latency between distributed services. This means that distributed data structures can be locked and released more quickly, reducing contention between shared data elements and reducing overall transaction processing time. Combined with R/3's growing use of object orientation, VI Architecture helps provide a dynamic, flexible environment that is easy to upgrade and support and is highly responsive to rapidly changing business needs.

Along with expanding R/3's scalability, VI Architecture also opens the door to additional savings in total cost of ownership for R/3 users. As hardware implementations that support the VI Architecture become available, OEMs who deliver turnkey R/3 systems can extend their offerings to include ready-to-run, high-performance clusters. With the delivery of pre-integrated, plug-and-play cluster solutions, R/3 customers can save on the expense of setting up and supporting these clusters.

Enabling the New Era

With industry support coalescing around VI Architecture, the momentum in scalable computing continues its shift from proprietary computers to smaller, highly flexible high-volume servers based on the Intel architecture. SAP is leading the way with its shared development project to enable R/3 users to take advantage of VI Architecture and Intel Architecture-based SHVs.

Because it provides an open way for applications to run transparently over large-scale high-volume clusters, the VI Architecture benefits the entire computing industry:

- **Customers** can run their most complex enterprise-class applications on affordable, high-volume computing clusters whose high availability, modularity and reliance on industry standards help reduce TCO.
- **Software vendors** can provide applications that are based on a common binary-compatible cluster API and can run on scalable, industry-standard platforms from a wide variety of vendors. New functionality can be added quickly, and applications can readily move onto new generations of hardware technology.
- **Hardware vendors** gain a framework for designing and building low-latency, high-reliability clusters for the volume space. This fosters the growth of economical, innovative implementations, which offer more value to end users.

While enterprise line of business applications, such as SAP's R/3, are among the first to benefit from the extended scalability of large-scale clustering, VI Architecture offers advantages to a wide range of applications, including web servers, workgroup servers, mail and messaging servers and gateways. For all these applications, the VI Architecture can help deliver affordable, high-performance solutions that scale to the highest levels of the enterprise.

For further information on the VI Architecture specification, visit Intel on the world wide web at:

www.intel.com/procs/servers

under industry alliances for business computing.

For information on SAP's R/3, visit SAP on the world wide web at:

www.sap-ag.de or www.sap.com

VI Architecture at a Glance

Over the last 15 years, high-speed networking hardware has advanced rapidly, with technologies such as ATM, Fast Ethernet and Fiber Channel offering orders-of-magnitude improvements over previous LAN and WAN technologies. On the software side, however, the overhead associated with communicating between the nodes of a large-scale cluster has remained essentially unchanged — until now. The Virtual Interface Architecture uses a distributed message passing (DMP) model that provides a safe means for the application to communicate directly with the network interface card. VI Architecture speeds communications by allowing messages to bypass much of the software overhead that caused slow communications when sending messages between the nodes of earlier large-scale clusters.

VI Architecture is an open industry specification designed to facilitate the movement of distributed enterprise applications onto large-scale, high volume, distributed message passing clusters. While some enterprise applications already run on large-scale computing clusters, most implementations to date have been expensive, proprietary interconnects that didn't provide the cost savings, flexibility and versatility of the high-volume computing marketplace. Nor do they deliver the process-to-process reduction in latency that VI Architecture makes possible.

The VI Architecture specification was developed initially by Intel Corporation in collaboration with Compaq Computer Corporation and Microsoft Corporation. Since the original development efforts began in January, 1996, more than 100 other industry leaders have joined and endorsed the collective endeavor. A preliminary specification of VI Architecture was distributed to participating vendors in January, 1997, and a final specification is expected to be released later this year.